Digital Energy
Battery Monitoring System

Battery management at its best
If you’re operating mission critical systems and relying on the protection of a UPS and battery bank, then it has to make sense to have battery monitoring. It’s about peace of mind – knowing that the batteries are healthy and being constantly monitored. Knowing that everything has been done, that can be done, to protect your enterprise from the consequences of a power failure.

**All batteries will fail, it is just a matter of time**

It only takes the failure of one battery to compromise the entire battery string. It is often assumed that batteries are meticulously maintained, but this is rarely so. Many batteries are not inspected or maintained beyond an annual UPS service visit. Unknown and undetected battery failures become apparent right at the time when you need the batteries the most – during a mains failure.

UPS systems provide only rudimentary battery monitoring. The UPS cannot identify faults within individual batteries, nor detect an imbalance in the performance of multiple strings. To ensure the integrity of the battery system, it is necessary to detect failing blocks before they affect the performance of the entire system. The effectiveness of a battery monitoring system is proportional to the number of points that are monitored and the frequency that this occurs. With regular monitoring comes the accumulation of data, the ability to report and spot trends, and the ability to take timely remedial action.

GE Digital Energy provides the most advanced and most cost-effective tool for monitoring and managing standby battery banks. GE Digital Energy’s continuous data sampling, reporting and battery management capability delivers reduced costs, gives peace of mind, and most importantly - ensures that you have batteries that perform when needed.

**Digital Energy – when and where it matters the most**

GE Digital Energy is trusted throughout the world to help protect the power supply of data centres, banks, hospitals, telecommunications operators, and a wide range of major commercial and industrial enterprises.

The GE Digital Energy Battery Monitoring System takes a modular approach to battery monitoring. This means that by selecting from a range of options, the system can be tailored to meet your specific requirements. Maintenance free VRLA or wet cells, lead acid or Nicad - Digital Energy has a solution for your battery.

The more critical your environment - the more necessary battery monitoring becomes
Understanding your batteries

**Individual battery voltage**
Incorrect charge voltages may result in loss of capacity, accelerated grid corrosion, excessive gassing and premature end of life. Voltage also identifies catastrophic failures, such as short circuit cells, and gives true visibility of performance under discharge.

**Ambient temperature**
A battery’s life-span is normally specified at 20 or 25 degrees centigrade. Temperatures outside of the specified range can significantly affect the battery’s corrosion rate, and therefore the life of the battery. An 8-10deg temperature increase can decrease battery life by 50%.

**String current**
String current monitoring measures the energy delivered or accepted by each battery string. A UPS will only measure total current and cannot detect imbalances between strings. An imbalance highlights potential problems within a battery string. String current measurement also allows detection of incorrect battery charging and any significant earth leakage faults.

**Total string voltage**
Tracking the string voltage confirms the charger is on and performing correctly.

**Individual battery impedance (ohmic value)**
The impedance of a battery will increase with age. High impedance results in a battery that cannot supply the required current – its key task. High impedance also highlights poor connections and open circuit batteries before failure. Batteries can fail in a very short period of time (less than a week) so measuring impedance daily allows you to detect faulty batteries - without the need to discharge them.

By trending impedance you can accurately determine the end-of-life of the battery.

**Battery temperature**
Measuring the temperature of each battery highlights localised environmental problems through poor HVAC. It can also highlight poor connections and excessive charger ripple. Temperature is a critical parameter for NiCad batteries.

Most importantly, battery temperature measurements allow the early detection of thermal runaway.

<table>
<thead>
<tr>
<th>Battery Monitoring System</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
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Many UPS failures are due to undetected battery problems
The financial benefits

By definition, wherever there is a bank of batteries, there is a mission-critical environment being protected. It follows that if the batteries are unable to perform when they are needed, the consequences and costs are going to be serious. Power failures happen all too often, and at a time like that, the investment in the UPS, battery bank, and battery monitoring system needs no further financial justification.

However, even in day-to-day operation, GE Digital Energy battery monitoring provides a strong return. The following cost savings are worth considering:

- Fewer batteries to purchase - through extending the useful life of those that you have.
- Reduced manpower – through automation & reduced number of discharge tests.
- Reduced call-out charges – through effective preventive maintenance.
- Planned battery purchasing – through avoiding emergency replacements.
- Reduced travel and time – through remotely accessing status data.
- Successful warranty claims – through having documentary evidence.
- Reduced insurance premiums.

Permanent monitoring not only offers increased measurement frequency and consistency, it allows this to be done with greater safety and security. Keep personnel out of hazardous battery rooms and away from sensitive plant & operations. Simplify your health & safety planning and focus on your core operations.
Data presentation is the key for efficient management

A single battery monitoring system can monitor up to 1,280 batteries. Connecting multiple systems via Digital Energy Link battery management software gives visibility to an unlimited number of batteries from a single desk.

Digital Energy offers:
- WAN/LAN integration for remote monitoring via Link software.
- RS 232 connection for local battery service & diagnosis.
- SNMP or Modbus interface to Building Management Systems.
- Dry contacts for alarm output.

Ensure that you can see and understand what is happening in your battery room.

GE Digital Energy Battery Monitoring Features

- 24/7 alarm notification.
- Automatic capture and recording of data during float, charge & discharge.
- Rapid voltage sampling - all batteries simultaneously every 4 seconds.
- Planned battery purchasing – through avoiding emergency replacements.
- Built in intelligence for battery state recognition and comparable impedance readings.
- Temperature compensation.
- User defined alarm limits.
- On-board memory.
- 750 VDC optical isolation.
- VRLA, VLA, Nicad.
- Flexible to suit battery model & application.

Link battery management software

- Proactive management tool
- Permanent connection to multiple sites
- Real time battery status
- Alarm & activity log with on-screen pop-ups and email alerts
- Live discharge display
- Automated data management
- Battery history database for life trending
- Point & click report generation
### Sentinel Monitor

The monitor captures, processes and stores data from a range of sensors. This includes monoblock voltages, impedance and temperature, string voltage and current, plus ambient temperature.

| Power supply                  | DC option: 48V - 110Vdc, max. 0.6A  
|                              | AC option: 110V - 230VAC/150/60Hz, max. 0.15A  
| Battery inputs               | up to 160 (scaleable to 1280)  
| Sensor type                  | Measure Module or m-Senzor  
| String voltage               | 2V-600V  
| Current inputs               | up to 160 (scaleable to 161)  
| Sensor type                  | Hall Effect  
| Measurement range            | 0A - 2000A  
| System accuracy              | ±1% + sensor accuracy  
| Maximum distance             | 15m / 50ft  
| Temperature inputs - ambient | up to 5 (scaleable to 161)  
| System accuracy              | ±1°C / 1°F  
| Measuring range              | 0°C to 50°C / 32°F to 122°F  
| Maximum distance             | 15m/50ft  
| Temperature inputs - battery | Variable - Pilot to 1 per battery by demand  
| Measuring range              | 0°C to 70°C / 32°F to 158°F  
| Measurement location         | Via m-Senzor at negative pole of battery  

### m-Senzor

#### Dual or Single Input

| Purpose | Measures monoblock voltages, impedance and temperature in a string  
|---------|---------------------------------------------------------------------  
| Application | VRSA, vented lead acid and Ni-Cad  
| Nominal voltage | Ni-Cad  
| Voltage measurement range | 2V - 600V  
| - Accuracy | ±0.3%  
| - Resolution | 0.001V  
| Impedance range | 0.15 - 5.00mΩ  
| - Accuracy | ±2.5% ±15uΩ  
| - Resolution | 1Ω  
| Maximum input voltage | ±5V  
| Power supply current | 50mA  
| Isolation | 750Vdc  
| Power supply | Powered by monoblock being monitored  
| Interface to Sentinel | BBUS II (maximum 150m/492ft per BBUS port)  

Digital inputs  
- 4  
Relay outputs  
- 4  
Rating  
- 1.25A 8 24Vdc  
Selectable  
Any rating configurable to any alarm  
Memory  
700kb  
Physical dimensions  
- Width 430mm / 17inch (19" rack compatible)  
- Depth 270mm / 10.6inch  
- Height 45mm / 1.8inch  
Operating temperature  
0°C to 50°C / 32°F to 122°F  
Storage temperature  
0°C to 10°C / 32°F to 158°F  
Service port  
RS232  
Com port 1 (optional)  
Primary monitoring connection with option of:  
- Ethernet - 100Base-T  
- RS232  
- Modem - PSTN or proprietary leased line mode  
Com port 2 (optional)  
Building management interface with option of:  
- RS485 or RS232 interface  
- Modbus ASCII or Modbus RTU protocol  
- SNMP  

4V and 8V m-Senzors also available. Contact GE Digital Energy for full details.

#### Measurement Module

| Purpose | Measures monoblock voltage in a string  
|---------|---------------------------------------------------------------------  
| Application | VRSA and vented lead acid  
| Nominal voltage | 2V  
| Voltage measurement range | 1.6V-2.6V  
| - Accuracy | ±0.25%  
| Maximum input voltage | 6V  
| Power supply current | 10mA  
| Isolation | 600Vdc  
| Power supply | Powered by monoblock being monitored  
| Interface to Sentinel | BBUS II (maximum 100m/330ft per BBUS port)  

Digital inputs  
- 4  
Relay outputs  
- 4  
Rating  
- 1.25A 8 24Vdc  
Selectable  
Any rating configurable to any alarm  
Memory  
700kb  
Physical dimensions  
- Width 430mm / 17inch (19" rack compatible)  
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- RS485 or RS232 interface  
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1 Greater distances may be used in a benign electrical environment  
2 Measurement module accuracy is ±0.3% for temperature range of 0°C to 50°C / 32°F to 122°F  

### Recommended PC system requirements for Link Software

- Processor  
Intel E5400 or better  
- Operating System  
Windows XP or better  
- RAM  
2GB  
- Hard Drive  
Single SATA 2 hard drive or better  
- Monitor  
1080 x 1050  

Recommended for up to 5 Sentinel sites, with single seat operation. Refer to GE Digital Energy for larger configurations.